# BRANCH OF RESEARCH

January, 1933.

## Contents

DEPARTMENT OF AGRICULTURE

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General

Thanks to emergency unemployment relief, the ranger dwelling, combined laboratory and field house, and temporary garage, at Kane were supplemented by two staff dwellings and a combined garage and work shop. These additional improvements will make it possible to devote the laboratory building exclusively to that purpose, and give us a very satisfactory field plant. A telephone line has been constructed to the headquarters, and a part of the administrative area has been fenced. Hough and Ackerman have drawn up a plan for intensive fire protection, which includes the construction of four miles of fire lines on exposed edges of the 1800-acre tract, but which emphasizes the opening of old woods roads in strategic locations.

The Pennsylvania Forestry Association is very actively backing the proposed purchase of a portion of the virgin timber on East Tionesta Creek and its donation to the Federal government as a combined research reserve and educational area. The president of the Association, and some seven or eight members of a special committee in charge of this project, visited East Tionesta in October. Supervisor Bishop has not only become greatly interested in the research reserve idea, but has developed an ambitious plan covering the 4000 acres in the proposed purchase and the 6000 acres of National Forest land surrounding it. Without in any sense losing sight of the central objective of obtaining a virgin area for scientific research, he and the committee feel that a larger plan for proper educational use of the surrounding area will make it possible for the Association to interest either foundations or individual philanthropists in the purchase.

Our cooperation with the Pennsylvania State College in research was enlarged by joint work with Mr. McIntyre, in central Pennsylvania, where Schnur and the Pennsylvania men studied some spectacular effects of the 1930 drought. The party found that on certain situations hemlock had been killed by the drought, and in other places that scarlet oak had suffered particularly. For some reason the drought appears to have been worst in rather restricted localities.

Management

Allegheny hardwoods. A crew of four student assistants together with Ranger Ackerman, and, for short periods, Forbes and Schnur, helped Hough to complete the 10 per cent cruise of the Kane Experimental Forest. A separate tally was made for each one-tenth acre of strip, and stakes, more or less permanent, were set every 10 chains on the cruise line. Topography was mapped at the same time. Although the value of a cruise of this kind may be questioned, it should be remembered that the Kane Forest shows great variation in the composition of the supposedly distinctive northern hardwoods type, and that until we have a pretty detailed knowledge of the commoner mixtures it is practically impossible to make a satisfactory map of the sub-types. A four-man crew toward the end of the season was able to cover 70 chains of strip in a day. Enough trees were bored by the crews to permit of a fairly accurate mapping of age classes. The permanent yield

(Over)

plots established will be described under the heading of mensuration. Forbes, Hough, and Schnur jointly drew up a list of what appeared to be the main problems of management which may be studied on this tract. The more intimate our knowledge of it, the better is our opinion of its possibilities as a place for research into the management of Allegheny hardwoods.

Coastal Plain. The study of natural reproduction with particular emphasis on soil moisture relationships, was carried on by Wood with the help of Dr. L. E. Yocum of George Washington University, and student assistant Chalfant. The largest single job of the summer was the excavation with a spray pump of the entire root system, down to the short roots, of a chestnut oak 1.3 inches in D.B.H. This proved to be an exceedingly laborious job, and Wood and Yocum say that they understand why so little work of this kind is recorded in the literature. An especially constructed stand for taking photographs vertically from above was employed in making a photographic record of the entire root system. Before excavation of the roots was begun a detailed map was made of the main branches of the crown, and as each root was excavated its position with reference to the crown was also plotted. When the entire job was completed all of the parts, both above and below ground, including the leaves, were oven-dried and total weight recorded. Forty-five per cent by weight of the entire tree substance was below ground; because the root wood is known to be of lower specific gravity than the stem wood, it is safe to say that at least half of the volume of the tree is in the roots. Wood counted the leaves on the tree, and made prints of a representative number; he did the same for an adjacent chestnut oak which will be converted into a sprout in February, and the root system of which, in part, will be studied next summer. A special effort was made to observe the abundance and general amount of the dead roots on the tree excavated this year, as it is on this point that we wish to obtain a comparison with the root system of a tree which has been converted into a sprout.

Observations were continued of chestnut oak and other seedlings in beds artificially watered, in those freed of root competition of the overwood by trenching, and in beds the acidity of which has been modified by liming. Soil moisture has been particularly studied in the artificially watered beds, and the effect of shading on surface temperatures has been observed in another pair of beds. In preparation for another season's work a considerable area at the headquarters cabin has been trenched in order to eliminate the root competition of the overwood, and to allow of a more exact study of other variables. Some natural chestnut oak seedlings have been screened, for the winter, and mulched, in an effort to prevent the winter killing which we suspect of being a serious source of injury to chestnut oak seedlings. Local seed has been collected for next season's work.

Measurements

Encouraging progress has been made on the oak yield study. A series of site curves (dominant height over age) has been completed; a straight line relationship between the logarithm of the number of trees on each plot and the logarithm of the average diameter has been made the basis for plot rejection on the grounds of abnormality, all plots which lie more than twice the standard error from the line being subject to further analysis before

acceptance; a decision has been reached to classify the large number of species to be found in the collection of plots under the heading of white oaks, black oaks, tolerant others, and intolerant others.

Schnur spent a little over a month at Kane, where he assisted to some extent on the inventory cruise, but spent the greater part of his time in the establishment of 15 permanent yield plots in the Allegheny hardwoods type. These plots are on the cruise lines, and the corners have been marked by iron posts. The plots are 1/10 of an acre, and a stem map has been prepared for each by gridironing them with string at intervals of 20 links each way. Diameter and crown class were recorded for each tree, and a generous number of heights were taken. Assistant Pathologist Jackson visited Kane about the time the permanent plots were being established, and sees in them an excellent opportunity for long-term observations of tree-rotting fungi. Both the Kane and the Camp Ockanickon areas are apparently serving some of the purposes of the Bureau of Plant Industry men very well indeed.

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## APPALACHIAN FOREST EXPERIMENT STATION

### Forest Management at Bent Creek

During January 245 cords of wood which had been cut last winter at Bent Creek were sold to the local Community Woodyard, an agency for the relief of unemployment. This wood is part of 310 cords which were cut on a unit of 17 acres of pine and oak as the first step in converting the stand to pine standards with hardwood coppice. The average cost of cutting, splitting and piling the wood was $1.93 per cord. It was sold to the Community Woodyard for $1.50 per cord, of which 40 cents will be credited to the Station in the cooperative fund and used for cleanings in the reproduction.

The Community Woodyard has been granted an administrative use permit to cut the wood on another unit of 1.4 acres. This unit is in an alluvial bottom now largely occupied by red maple and rhododendron. It will be clear cut except for yellow poplar seed trees.

### Weather Records at Bent Creek

Interesting data are being collected at three weather stations located so as to record local variations in climate on one of the slopes of Bent Creek Valley. One station is near the Creek at an elevation of 2100 feet; a second midway of the slope at 2300 feet; and a third just under the ridge top at 2500 feet. These stations are about 15 chains apart horizontally, all are under forest cover, and on an even slope with a northwest aspect.

On clear, windless nights the temperatures at the bottom station are consistently the lowest and those at the top station are the highest. Differences in minimum temperatures as great as 18 degrees between these two and as great as 11 degrees between the bottom and middle stations have been recorded. The monthly mean temperatures, computed for every two hours during the day for October, November and December show that the 2100 foot station

is colder than the 2500 foot station by 3 or 4 degrees and colder than the 2300 foot station by 2 or 3 degrees between 6 P.M. and the following noon. This inversion of temperatures has often been noticed before in mountainous countries where the topography is such that cold air drains into valleys and collects there, forming "frost pockets". The effect of this phenomenon on forest development has not been fully investigated.

L. T. Pierce, of the local Weather Bureau Office, is cooperating with the Station in this work. He has also helped to establish a fire weather station at the Bent Creek laboratories like those which he has located in 13 other places throughout the Southern Appalachian Region.

Forest Management in North Georgia

During January computations were completed on the comparative growth study of white pine and its associated species. This study, comparing the diameter growth of white pine and 8 of its most common associates, establishes fairly definitely the more rapid growth rate of white pine. Computations required the growth analysis of 2336 dominant and codominant sample trees.

A set of site index curves for white pine was prepared in the conventional way, except that the heights of individual dominant and codominant trees were used in drawing the graduating curve. Ordinarily these site index curves would not be considered as adequate as a set based upon the average height of the dominant trees in pure even-aged stands. However, pure stands of white pine are rare in the Southern Appalachians. Used with an understanding of their limitations the curves provide a means of roughly determining site value.

Fire damage - Mountains

The 20-acre experimental burning plot which was established at Bent Creek during the past summer was burned on December 8. In general the fall fire season in this vicinity was not hazardous, and in spite of a rainless period of almost 300 hours immediately preceding the fire only a light to medium fall burn was obtained. Temperatures of the going fire based on 17 setups with Seger cones and 9 setups with thin ribbons of fusible metal alloys were as follows:

| | | |
|---|---|---|
| Surface temperatures - | light litter | less than 600° C. |
| | medium and heavy litter | from 600 to 800° C. |
| | slash | from 600 to 1000° C. |

| | |
|---|---|
| 5 feet above ground | generally 200 but not 400° C. |
| 10 " " " | " 100 but rarely 200° C. |
| 20 " " " | occasionally 100 but not 200° C. |
| 30 " " " | less than 100° C. |

Laboratory tests on the insulating property of the bark of yellow poplar and four species of oak during the dormant season were completed during January. A total of 250 tests were made on barks ranging in thickness from 0.06 to 1.0 inches.

## Fire Damage - Coastal Plain

The litter samples taken from the controlled burning plots at the Lanes, South Carolina, showed that the plots which were accidentally burned in December, 1931, after 14 years protection, had an average of 6,146 pounds of litter per acre, while the annually burned plots had only 3,958 pounds per acre. This definitely heavier deposition on the accidentally burned plots of 2,188 ± 364 pounds, was probably due to the more severe heat killing of the crowns.

Preliminary analysis of bark thickness measurements on unburned and accidentally burned plots shows that the fire removed an average of .2 inches of bark from the trees.

## Forest Influences

December 31, 1932, marked the completion of the first six months of continuous record of stormflow from ten permanent plots on the Bent Creek Forest. From these plots, representing four common forest types, stormflow was measured as surface runoff and as subsurface flow at 12 inches.

On plots established in an oak-pine type where all litter has been removed for three successive years, the surface runoff for the six months period ending December 31, 1932, was six times the surface runoff on adjacent plots where the litter was undisturbed. This comparison indicates that the removal of the forest litter has significantly reduced the amount of precipitation that is readily absorbed into the soil. Thirty rain storms and one snow storm were recorded during the last six months of 1932.

In December, 1932, 8 additional plots for measuring surface runoff were placed in the burned area established for fire damage study at Bent Creek. Four plots were placed on burned and four on adjacent unburned areas, on 30 per cent and 45 per cent slopes. No severe storms have occurred since observations were started.

## Forestation - Planting

Data taken in the examination of all plantings at Bent Creek last summer were analyzed. These plantings vary widely in size and are grouped in three places in the valley; the arboretum site, Shut-in Ridge, and the Case Place. The arboretum site is a bottomland old field near the mouth of Bent Creek. The Shut-in Ridge site is a series of old fields on the crest of the ridge and the Case Place site is a large old field having moderate slopes, about 3 miles up the Bent Creek valley from the arboretum.

None of the plantings are over 6 years old, so the figures may have little significance as far as ultimate suitability of the species for the various sites is concerned. Heights of individuals in the plantings range widely and the differences between adjacent species are probably not significant.

The poor showing of yellow poplar (Liriodendron tulipifera) on Shut-in Ridge and in the Case Place particularly is probably due to deer browsing. Six poplar plantings in the Case Place had an average survival of 83 per cent (4 and 5 years old), but 70 per cent of the trees living in 1932 were damaged and 77 per cent of the damage was attributed to deer browsing.

Forest Biology

Immediately following the experimental fire of December 8, 1932, at Bent Creek, Burleigh began trapping mice on the area. Intensive trapping was carried on throughout the rest of the month to determine the possible effect of fire on the rodent population. This study extends similar work started on Rocky Knob last winter.

Heavy snowfalls on December 16 brought south certain boreal birds rarely found here during the winter months. Among others three tree sparrows (Spizella arborea arborea) were observed. This observation is the first definite record of the species in North Carolina.

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## CALIFORNIA FOREST EXPERIMENT STATION

Forest Management - Redwood Region

In the study of cut-over areas, records were taken on several different factors that might affect stocking. The relation between amount of slash on the ground and stocking is shown in the following table based on the examination of 7081 milacre quadrats in 1932.

The Effect of Slash Density on the Stocking of Redwood Cutover Areas. North and South Exposures Compared.

| Amount of slash | Stocking in Per cent | | | |
|---|---|---|---|---|
| | All exposures | | All conifers | |
| | Redwood seedlings | All coniferous seedlings | North exposure | South exposure |
| None | 14.9 | 22.9 | 27.7 | 15.0 |
| Light | 16.0 | 24.1 | 27.6 | 19.9 |
| Medium | 13.6 | 18.6 | 19.7 | 16.4 |
| Heavy | 10.2 | 14.1 | 12.2 | 13.2 |
| Very heavy | 0 | 0.7 | 0 | 3.7 |

Apparently light slash is more favorable than either no slash at all or medium or heavy slash. This seems logical as we would expect a small amount of slash to give some protection to the young seedlings. As the slash increases in abundance the chance of seed reaching the ground is decreased and stocking decreases in consequence so that on plots with nearly 100 per cent of the area covered with slash we find very few seedlings.

If slash is beneficial in protecting seedlings from high temperatures and excessive transpiration we would expect this effect to be more pronounced on south slopes than on north slopes. This is brought out in the second part of the table which shows that maximum stocking on north exposures, where protection from the sun is not needed, is found on the plots having no slash. On the south exposure it was found that the best stocking is found on plots with some slash and that the stocking on plots with medium slash is better than on plots with no slash.

Forest Survey

In 1932 some 6,210,000 acres was mapped either by Experiment Station crews or under the direct supervision of the Experiment Station. In addition incomplete returns from the National Forests indicate that nearly 2,000,000 acres were mapped under the direction of the Forest Supervisors.

Aside from field mapping considerable time was spent during the summer of 1932 in preparing 4 quadrangles for publication. Type names, color legend, and form of publication had not been definitely crystallized. A great deal of labor was involved in preparing tracing velum correction overlays, designating the final color and species symbols, in planimetering type areas, and in the preparation of vegetation profiles. It was also found necessary to make some additional field checks where data were found incomplete. This latter seems to be a price we have to pay when we use contributed men or temporary men for short periods. The men are not to be blamed for their work was surprisingly well done when it is considered that they had to learn the intricate mapping job and turn out results all within two or three months.

Forestation

Severe weather throughout California precluded any extensive outdoor work during January either in nursery or planting. Weaver and Ilch continued office work on the Devil Canyon general map and the building up of a card index record of plantations with some help of temporary assistants. Germination tests in the greenhouse, and the planting of Ceanothus cuneatus in Doctor Lowdermilk's water-cycle tanks in Strawberry Canyon were among the month's tasks. Depredations upon the newly-set Ceanothus plants by wood-rats from surrounding brush required protective measures in the form of a repellant spray recommended by biologist E. E. Horn. Trapping or poisoning the rodents was ruled out of consideration by the dictum of the University biological staff to maintain the canyon in as nearly natural conditions as possible. Since funds for fencing the tanks are not available we are forced to rely on the spray, whose chief ingredients are linseed oil and flowers of sulphur. We are hopeful that this will be more effective than the moth balls which Dunning says were playfully used as marbles by his Stanislaus rats.

Kraebel had several conferences with Dr. W. F. Gericke of the University Division of Plant Nutrition on the continuation of their cooperative experiment on the aquaculture of conifers, and on the drafting of a short paper for publication. In the new set-up Professor Baker of the University Forest School will also cooperate.

## Forest Influences (Erosion and Streamflow)

January was a rainy month in California at lower elevations, with snow at higher elevations. One of the heaviest snow packs of the past 30 years lies on the mountains in southern California. Snow lines have descended to lower than usual levels. This fact emphasizes comments in these reports of last year.

Heavy rains and snow on the badly burned Juncal watershed were the occasion for an inspection trip by Lowdermilk and Rowe to see how the check dams had held, and how much erosion had occurred with consequent sedimentation in the reservoir. On January 20 a 6.40-inch rain fell within 24 hours, two days after a 4-inch rain. Fortunately for the water district and usefulness of the reservoir much of this heavy storm occurred as snow on the upper slopes of the drainage. Great masses of ash, litter and charcoal were washed into the reservoir to cover fully 35 acres of its area.

An examination of check dams which failed and those which withstood the force of flood currents was made. A report on these is being prepared by Rowe.

## Watershed Study

The event of the month of chief importance was approval by the Forester of the triplicate watershed study for the chaparral region. This approval has enabled us to proceed with design and plans for structures and for details of service roads and the like.

## Erosion Control

Matilija Burn. Weather conditions have been far from favorable for the success of the seeding effort in parts of the big Santa Barbara burn. After almost continuous drought and several high winds since seed was sown on the 6000 acres of the burn, the dry spell was finally broken by a heavy downpour in mid-January. Examination by Kraebel showed that most of the seed was in the early stages of germination when the storm struck, but that serious erosion had been fortunately prevented by the cold weather which had caused the heavy precipitation to fall as snow over most of the seeded area. Black mustard was the most advanced species on January 22, and clusters of it were found with well developed cotyledons and traces of secondary leaves. A few upright spears of wheat were observed but for the most part the swelled seeds of other species either lay loosely on the wet soil or were attached by slender radicles and battered flat by the rain. Everywhere the tiny deltas formed by shoestring gullies were thickly studded with germinating seeds, and the gully-sides were similarly marked. Hundreds of erosion pins examined at random showed little net change in soil surface. If the weather remains for even a few weeks favorable for growth the final effect of the seeding on erosion control will be very great, but should the tender seedlings now be exposed to excessive freezing or drying winds their ultimate effect may be reduced to insignificance.

Erosion Control - Roads. Kraebel has been cooperating with the Regional Engineering office on the interesting problem of planning in advance for the reconstruction of five miles of road in the Angeles Forest with a minimum of scenic disturbance. This action goes to the heart of the problem, for to plan a forest highway with the objective of scenic preservation in mind from the very start may avoid much needless damage and may reduce considerably the area of fill slopes to be revegetated after construction.

## Fire Research

Current coding of 1932 individual fire reports is well under way. The machine runs of punched card data on lookout observations of natural targets is practically completed. Analysis of these figures will allow the presentation of the factors influencing radius of vision.

An improved model of the brush cutting saw has been constructed. The new model is more mobile, more efficient and much easier on the operator. The original model showed merit in numerous field tests and improvements were made on the basis of these tests. The present machine consists of a light but strong iron frame on two bicycle wheels, supporting a 1-1/2 horsepower gasoline engine. On an arm at the forward end of the frame there is a circular saw driven by a "V" belt from the engine. A handle bar at the rear affords easy manipulation by the operator. Additional tests will be made during the ensuing spring and summer.

## Forest Products

### Logging and Milling Studies

The University of California printing office finished the first page-proof of the Stanislaus Study bulletin early in the month so it was expected that the final printing could be announced (at last) in this issue of the Monthly Report. But Fate interfered, as usual, and the printing office had to side-track all other work to make way for the Agricultural Experiment Station's annual report.

The final report is being prepared as an appraiser's handbook, with time-study, or crew-output data and other information dissected and presented in such a manner that any west-slope pine operator can make a reasonably accurate estimate of comparative cutting system margins for his own timber, using current wage scales and selling prices. Inefficiency caused by poor organization, lack of proper equipment, careless supervision, etc., can be accurately gauged from analysis of the finely divided segregations of time items recorded in the field, thereby permitting a separation of effective time from obviously wasted time.

Tables to show the highly important bearing of the log-length variable on bucking-to-pond costs have been worked out for each species. It is hoped that these will make a forceful impression on those operators in the big timber belt of the Sierra who put a premium on speed rather than care in the felling operation. Breakage in the tops may not look so bad to the Superintendent as he strolls through the woods - unless it happens to be the shatter

type of complete demolition - but if he studies the figures on subseqnent costs of the shorter logs resulting from the "harmless" looking breaks here and there perhaps he will change his mind. Eighteen-inch sugar pine logs, for example, were bucked, yarded, loaded, hauled to the mill and dumped in the pond for $8.08 per M.B.M. when they were 32 feet long, but if a break necessitated bucking a 16-foot length, the cost per M.B.M. went up to $12.16 for the same diameter, and a 10-foot length entailed costs of $15.23 per M.B.M. The illustration goes to show, also, how little mere diameter-cost relations mean in respect to comparative woods costs. A 10-inch, 32-foot log was put in the pond just as cheaply as an 18-inch, 16-foot log, or a 22-inch, 10-foot log.

## Economics

### Eldorado County Land Use Study

The text for a University of California bulletin on this cooperative project between the Station and the Giannini Foundation is nearing completion, the forest portions being prepared by Wieslander and Hill. On January 19 they accompanied Director Tolley and Prof. David Weeks, of the Foundation, to Placerville for an evening meeting, to get the reaction of about 15 of the "leading citizens" of the County before the results were finally committed to text.

Very possible sharp opposition was expected to a recommendation of actual depopulation and reconversion to forest of over 150,000 acres of the private land of the county, mainly in the upper portion of the agricultural zone where settlement is scattered and isolated, notwithstanding the clear showing of Wieslander's field study that this second-growth area, cut over in the mining days and since, has forest site indices so high as to make it yield a greater profit per acre in timber growing than in any other use to which it is now being put. To the surprise of the main performers at the meeting there was practically unanimous approval of the proposal, coupled with a proposal from the floor itself for the addition of the area to the National Forest. A large part of the area in question is already within the Raker Act extension limits. The genuineness of the interest in the study results was indicated by the fact that, although the meeting was called at 7:30 with a view to finishing within the early retiring hours of a rural community, the discussion and questions from the floor did not lull so as to permit adjournment until 12:10 a.m.

### Foresters in the Air!

The use of airplanes by forest officers on fire duty has now becomc commonplace; in recent months, what with urgent doings at G.H.Q., we have even grown accustomed to seeing our Station Director and the Regional Forester hop casually over the high Sierra bound for Washington; Lowdermilk and Kraebel have even found it pays to take to the air occasionally to inspect watersheds. But it has remained for Dave Ilch to set the precedent at our station for real joy-riding by air. Dave took ten days of his furlough over the holidays to make the round trip by air to his home near St. Louis, Missouri. He reports the view of the snowy Sierra Nevada quite beyond description and will probably be a firm convert to air travel henceforth.

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## CENTRAL STATES FOREST EXPERIMENT STATION

### M-1 Forest Litter Project

Dr. Auten has completed the laboratory analysis of the litter and soil samples collected last summer and is now engaged in the compilation and statistical analysis of the results.

### Black Walnut Site Study

Kuenzel completed the mechanical analysis and Bouyoucus test of soil samples from 50 Illinois and Indiana Black Walnut plantations. This work was undertaken at the O.S.U. Engineering Experiment Station laboratories, where subgrade soil testing equipment was available. Upon completion of the Ohio and Kentucky plantation samples, sufficient data will be available to undertake a thorough investigation of the relation between the rate of growth, as expressed by the site index ratio, and the soil characteristics.

### M-2 Woodland Grazing Project

Day has been organizing his manuscript on the Reconnaissance Phase of the Grazing Study. This report will possibly be mimeographed this winter for limited distribution and possibly published at a later date. Considerable statistical data compiled by Dr. Meyer from the 1925 census are being carefully examined and in many cases recompiled in the light of the 1930 census figures.

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## INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION

### Erosion and Streamflow

### Utah Flood Survey

A preliminary report of the survey of destructive floods in recent years in the State of Utah, conducted in 1931 and 1932 under a cooperative agreement between the Utah State Land Board, the Utah State Agricultural Experiment Station and the Intermountain Forest and Range Experiment Station has been completed and forwarded to the Utah State Land Board. The report covers 26 areas in the state which have flooded in recent years. The report was compiled by Director C. L. Forsling and Asst. Range Examiner Milo H. Deming of the Intermountain Experiment Station, and Profs. R. J. Becraft and R. W. Bailey of the Utah Agricultural College who were engaged in this investigation.

The report treats briefly for each area, the location of the watershed and damaged areas; the history, nature and resultant damages of floods; the topography, geology, soil and cover conditions on the watershed; the causes of floods; the ownership and use of watershed lands; and recommendations for measures to abate floods.

as a whole. In 9 cases the watersheds include more or less national forest land which contributed to the floods. In all except two of these nine cases involving national forest land, there has been a material improvement in cover and reduction in severity of floods under national forest management although in at least three cases conditions were so bad when placed under administration that subsequent range management has not been adequate to prevent the recurrence of fairly serious floods.

The recommendations for remedial measures were concerned principally with the development of watershed protection and range management policies which would provide for the rehabilitation and maintenance of adequate watershed cover.

The place of protective engineering structures in flood control work is only briefly mentioned, since that phase comes properly within the scope of another report submitted by another agency.

## Range Management

### Desert Experimental Range is Designated

An area of approximately 55,000 acres of desert range in Millard County, western Utah, has been set aside by executive order and designated as a desert range experimental range to be administered by the Intermountain Forest and Range Experiment Station.

This range is located about 40 miles west of Milford, Utah, near the Utah-Nevada state line and is situated in the northern end of Pine Valley. The area includes all the major vegetative types found in the desert region of western Utah and eastern Nevada except greasewood (Sarcobatus vermiculatus) and sagebrush (Artemisia tridentata). Omission of these two types is not serious since the true greasewood type is of relatively minor value for grazing and sagebrush is not a true semidesert type and will be adequately covered in the sagebrush-bunch grass range project. In all, eleven types are represented, large enough in area to permit experimental work to be done in

each, as well as with composites of several types.

The study of winter desert-shrub ranges to be done on this tract is authorized by the McSweeney-McNary Forest Research Act. Since this range is located somewhere near the center of the winter grazing lands, it affords splendid opportunities to study and develop methods of grazing management which are best suited for this arid region. The desert-shrub range project was started in 1931 and work to date has been confined to studying the problem in its broader aspects. It has shown that the grazing capacity of these desert ranges has been reduced 68.6 per cent and in many places this depletion is continuing. Palatable plants in many places have been replaced by plants of low value, some of which are worthless as forage. This has resulted in inadequate feed for the livestock using the ranges. Malnutrition has increased winter losses, especially in years of drought when they may exceed 20 per cent, as in the winter of 1931-32. The calf and lamb crops are far below what they would be on good ranges and increased supplemental feeding is adding appreciably to the cost of operation. Thus the problem is largely one of developing methods of grazing management that will somewhat stabilize the livestock industry and yet make possible the restoration of satisfactory range conditions.

The establishment of this range makes it possible to centralize the experimental studies and will greatly facilitate the work.

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## LAKE STATES FOREST EXPERIMENT STATION

The annual investigative meeting was held on January 19 and 20 at the Station. Besides the full Station staff, there were in attendance Mr. Wales, representing the Regional Forester, and Forest Supervisors Harmon and Bean. The time of the meeting was largely given over to a presentation of the "research needs" of Region 9.

In the discussion it was brought out a number of times that there was already available in published or manuscript form much information bearing on the questions raised. However, research reports frequently are published in journals which are more or less obscure so far as Forest Supervisors are concerned, unless reprints have been distributed. Also, there is considerable manuscript material which, for some reason or other, never has been called to the attention of the Supervisors.

The question is how to get research results out to administrative officers in the most usable form. In the face of possible expansion in forest activities, there is an acute need for reliable information.

Publication of results in Government bulletins is now restricted and the process is slow. The Experiment Station men at Branch Stations act more or less as liaison officers and help to disseminate some information. "Technical Notes" hit the high spots but do not go into enough detail for forest practitioners. Apparently there is a need for up-to-date summaries

of various research projects, such as thinning. These summaries should include digests of published material and new research results in boiled-down form. Since printing is out of the question, mimeographing would be necessary.

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## NORTHEASTERN FOREST EXPERIMENT STATION

Arrangements for the annual winter meeting of the Advisory Council of the Station, which is to be held in Boston early next month, were completed during January. The two principal topics which will be discussed at the meeting are the distribution and control of the European pine shoot moth and forest fire research. Invitations have been sent to entomologists and others who are interested in the pine shoot moth situation. The first report of available information on this pest which has been collected and summarized by a special committee of the Council will be presented at the meeting. In order to guide the Station in its forest fire research program a selected number of guests representing the forest schools, state forestry organizations, forest industries, etc., have been invited to present papers on further additional fire research which the Station should undertake. The Station's ideas on further forest fire research are embodied in a working outline which Stickel has prepared for distribution to members of the Council.

MacAloney assembled and correlated the information contained in the letters from the various agencies cooperating in the European pine shoot moth inquiry. This material was turned over to the Committee from the Advisory Council and is to be presented to the meeting in Boston on February 8.

Stewart and Morey spent the month compiling and analyzing the data obtained from a study of 55 plots in the method of planting study, including the 9 Booneville Scotch pine plots. A progress report of this phase of the reforestation project is now being completed. Compilation of the data from the examinations made in 450 plantations was begun.

In general, it was found among all the coniferous plantings examined in 1932 that 38.5 per cent of the trees were set correctly. These had a fall mortality of 13.2 per cent. There was strong tendency to set trees low. 35.5 per cent were set slightly low and these also had a mortality of 13.2 per cent. Trees set quite low amounted to 8.5 per cent and of this group 19.9 per cent died. Trees set very low, that is practically buried to the top of terminal bud, were 2.6 per cent and these had 31 per cent loss. There were 4.2 per cent set high with a mortality of 23.9 per cent, and 7 per cent set loose with 31.2 per cent dead trees. It is clear that planting trees high or very low or loose resulted in a greater loss than occurred with trees planted normally. General averages such as this are somewhat deceptive as they tend to obscure the variations in survival which occur with good or poor sites.

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## Fire Protection

The January "job-of-the-month" for Gisborne was coding the 1212 fire reports for 1932. With three men coding, each with a girl assistant to do the writing, this work was completed exactly on the schedule established last fall. The rate of coding varied considerably with the high man averaging about 42 reports per day.

One new feature was included this year by tabulating for each fire the principal purpose of management of the land on which the fire started. This will permit us to count not only the number of fires, but also to determine the area burned, the cost of suppression, etc., for each fire starting in the so-called back country. The entire Region has been classified to show whether each quarter section is principally valuable for (1) timber production, (2) grazing, (3) recreation, (4) watershed protection, (5) wild life, and (6) probably scenery, possibly game, and incidentally sources of streams. These six classes of management purpose were designated by Meyer Wolff after receiving maps prepared by Koch, representing his opinion of timber growing values, and by Glenn Smith, representing grazing. This first classification is recognized as a mere beginning, and it is intended to revise the map continuously until it presents the best concensus of opinion concerning the purpose of management of R-1 lands. It is only on such a basis that we can determine an economically justifiable allocation of fire control effort.

## Silviculture

The oldest methods of cutting and reproduction plots in the western white pine type on which intensive annual reproduction examinations have been conducted are now seven years old. These plots contain over a thousand quadrats on which the seedlings are staked annually and record is kept of germination and mortality. The two tables which follow illustrate one aspect of the sort of information being yielded by these quadrats. Plot 121 is ten acres in area, contains 100 mil-acre quadrats, and represents an excellent average condition of eight white pine seed trees over 16 inches d.b.h. per acre.

TABLE I

Reproduction in 1932 by Species on Plot 121.
Logged in 1925-1926

| Year of germination | Western white pine | Western larch | Doug. fir | White fir | Hem-lock | Cedar | Eng. spr. | Ldg. p.p. | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Number of seedlings per acre on ground in 1932 | | | | | | | | |
| 1926 | 130 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 150 |
| 1927 | 950 | 220 | 30 | 390 | 3120 | 240 | 90 | 20 | 5060 |
| 1928 | 130 | 40 | 0 | 10 | 160 | 200 | 20 | 0 | 560 |
| 1929 | 30 | 60 | 0 | 0 | 360 | 1400 | 40 | 0 | 1890 |
| 1930 | 80 | 60 | 10 | 120 | 3520 | 6360 | 10 | 0 | 10160 |
| 1931 | 160 | 350 | 0 | 40 | 200 | 120 | 0 | 0 | 870 |
| 1932 | 220 | 310 | 0 | 0 | 1400 | 280 | 0 | 0 | 2210 |
| Total | 1700 | 1060 | 40 | 560 | 8760 | 8600 | 160 | 20 | 20900 |

TABLE II

Number of seedlings per acre originally
and in 1932 on Plot 121

| Year of germination | All species: Started originally | All species: Survived in 1932 | Western white pine: Started originally | Western white pine: Survived in 1932 |
|---|---|---|---|---|
| 1926 | 290 | 150 | 230 | 130 |
| 1927 | 12430 | 5060 | 1510 | 950 |
| 1928 | 1520 | 560 | 210 | 130 |
| 1929 | 4600 | 1890 | 80 | 30 |
| 1930 | 15160 | 10160 | 190 | 80 |
| 1931 | 1960 | 870 | 260 | 160 |
| 1932 | 2210 | 2210 | 220 | 220 |
| Total | 28170 | 20900 | 2700 | 1700 |

Over 80% of the reproduction that started on this plot was hemlock and cedar, which incidentally, is typical of conditions in the northern part of the white pine type. From this it is evident that the great proportion of the mortality of young seedlings revealed in Table II is among the hemlock and cedar. This is a natural consequence of the shallower root systems of these two species confined, as they are, largely to the duff and humus layers, which dry out readily in dry seasons. The roots of the other species and particularly of white pine extend through the duff well into the soil. Certain significant facts are to be considered in interpreting the data of the tables. The growing seasons of 1926, 1929, and 1931 were extremely dry. That of 1927 was unusually moist. Seedlings of species in the white pine type are susceptible to death throughout the first three years of their

lives. Number of seedlings per acre is not regarded as significant until after the third year of a seedling's life, and even after that such shallow rooted species as hemlock and cedar may suffer considerable mortality. The fall of 1926 produced an excellent cone crop and that of 1927 a poor crop. The 1929 crop was fair for most species.

Although there are only 1700 white pine seedlings on Plot 121, as compared with the total number of 20,900 seedlings per acre, the white pine reproduction is well distributed and gives every indication of producing the dominating trees of the stand.

## Logging and Milling

At the time of the A.C.M. study pictures of over 100 individual trees were taken. Slides have been made from these which it is proposed to use for an illustrated talk on economic selective logging. An attempt was made to secure pictures of all types of trees as reflected by quality, age, defect, etc. For instance, one picture (slide) shows an excellent example of the effect of recurring fires on the quality (conversion value) of old growth trees. During its lifetime of 490 years, the tree pictured withstood the ravages of not less than four fires, and at the time of logging it was still alive although in poor vigor. Naturally the butt log of the tree sustained the greatest damage from the fires. An analysis of the yield of lumber produced from the four logs obtained from this tree follows:

Per cent lumber yield by grades

| Log position | Select | 1 & 2 Shop | 3 Shop & Inch shop | Common | | | |
|---|---|---|---|---|---|---|---|
| | | | | 1 & 2 | 3 | 4 | 5 |
| Butt | 16 | 0 | 3 | 0 | 12 | 44 | 25 |
| 2 | 59 | 0 | 1 | 0 | 40 | 0 | 0 |
| 3 | 13 | 13 | 9 | 0 | 26 | 39 | 0 |
| T | 0 | 0 | 0 | 0 | 10 | 90 | 0 |

The small amount of select in the butt log, as indicated by the above figures, is no doubt entirely due to the fire scar. The yield of select for the butt cut was only 16% compared to 59% for the second log in the tree. It has been ascertained for sound overmature trees that the butt cut is consistently equal and usually better in quality than the second or third logs in the tree. An examination of the lumber produced from logs 3 and 4, which respectively produced 39% and 90% of number 4 common lumber, showed considerable rot. This condition is quite common in trees that are badly fire scarred and can no doubt be indirectly attributed to the fire damage.

A computation of the selling value of the lumber produced from this tree also shows the butt log to have a lumber value (green chain grade based on 1928 average prices) of $6.21, compared to $16.73 for the second log. Thus the net loss to the butt log from fire scar was $10.52, or the lumber produced from the butt cut was worth $20.70 per thousand lumber tally, compared to $41.82 for the second cut - a startling loss for which the fire

scar was directly responsible. Such a log as this cannot be profitably converted into lumber even under normal market conditions. Consequently it should be culled out in the woods. This tree should have been long-butted at 8 feet above the stump cut and two 16-foot logs utilized above that point. The first log would have then yielded as good a grade of lumber as the second log actually did, while the next log would have also produced a good yield of select. Thus the number 5 common lumber could have been entirely eliminated, as well as more than half of the yield of number 4 common.

Forest Survey

The work of adjusting the timber estimated of the several large private owners in Benewah County, Idaho, was continued during the month.

Mr. Bradner spent the last ten days of January collecting private cruise and other forest data in Boundary and Bonner Counties, Idaho. Three lumber companies own the bulk of the private timber in these two most northern counties of Idaho. One of these companies discontinued operations in 1925 and at a time when it still had a number of years supply of timber in reserve. At present a good share of its cut-over and burned lands are going delinquent and the last years' taxes on some of its merchantable timber have not been paid. Another of these companies did not operate any one of its three sawmills during 1932 and it is rumored that they are closed for good. One good sized block, approximately seventy million feet of Idaho white pine, was sold by this company to a small independent operator who installed a band mill on the unit and is cutting match stock. The third company is a match company and should continue to operate on much the same basis as heretofore. It buys considerable State timber.

The Forest Service, the State of Idaho, and the Northern Pacific Railway Company are the other principal forest land owners in these two counties. There are, of course, a few small operators, but the holdings of these are relatively small. There has been considerable cutting over a long period of years in both Bonner and Boundary Counties and fires have been numerous and highly destructive.

Earlier in the month Mr. Whitney made a second request for information on building permits, costs, repairs and so forth, to the building inspectors and County Assessors in 29 cities and towns within the Region. Work on this particular phase of the Requirements study was rather limited in January, as it was necessary for Mr. Whitney to spend considerable time getting the 1932 lumber census for Idaho and Montana under way.

Census

Mailing of the questionnaires for projects on which this Station will cooperate with the Bureau of the Census by collecting 1932 statistics of lumber production, lumber distribution, and stumpage and log prices was completed on January 24.

Including concerns in southern Idaho for which Region 4 will obtain returns, the Form 380-W.S. for reporting lumber, lath and shingle reproduction was sent to approximately 500 sawmill operators in Idaho and Montana. Since lumber distribution reports are required only from mills which ship their product in interstate commerce, the Form D lumber distribution schedule was sent only to the Idaho-Montana mills which may have cut more than one-half million feet during the past year.

In order to secure representative data on stumpage and log transactions for this Region, on the same basis as that being collected in other parts of the country, the Form S questionnaire was mailed to practically all mills. As usual, the preliminary mark required in starting each census included preparation of new mailing lists, first request circulars and some correspondence with Region 4.

Range Management

Junior Range Examiner Kennedy has been in Missoula since early January and plans to return to Miles City some time in February. Kennedy's time in the office has been devoted to maps of pasture layouts, compilation of reconnaissance and quadrat data, etc.

The 60 cows on range tests at Miles City have wintered without supplemental feed until late in January when one lot of ten from one of the overgrazed pastures required hay. This lot lost weight quite rapidly during October and at least part of November before being moved to winter pasture on December 1, even though little or no damage was done from overgrazing the range. The cattle on normally and undergrazed pastures promise to finish the winter in good condition on range alone.

Following the Spokane meeting of the Northwest Scientific Association, Hurtt made a brief trip at Mr. Rockie's request over the Pacific Northwest Soil Erosion Experiment Station near Pullman, Washington. One striking fact emphasized there is the greatly accelerated soil washing resulting from the nearly universal practice of summer fallowing in the Palouse wheat country. A new sub-station is planned to attack the erosion problem, largely wind, on more arid plowed and abandoned lands of central Washington.

That the three years drought broken last April after the dryest year of record, 1931, seriously depleted blue grama grass range is indicated by the few quadrats compiled to date. Approximately 37% of the grama grass clumps was considered dead at the initial charting last fall. Probably some of the dead grama would have succumbed under more normal weather conditions and some charted as dead may possibly show life next season. It is therefore not yet clearly established that 37% of the grama grass was actually killed by the long drought, even though a very severe loss is clearly indicated.

This occurred on closely to moderately used, but not overgrazed range. This indication of depletion by drought is sufficiently clear to justify a heavy discount on the frequently heard statement in eastern Montana to the effect that one season with good rainfall will entirely rebuild overgrazed

grama grass ranges. Such statements are not based even on careful observation and are wide of the truth. Grama grass has remarkable tenacity and ability to withstand punishment, but there are definite limits.

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## PACIFIC NORTHWEST FOREST EXPERIMENT STATION

### General

Section of Silviculture Created - Effective January 30 a Section of Silviculture has been created at the Experiment Station to facilitate supervision and coordination of the projects coming within the field of fire studies, natural reproduction, forestation, management, forest influences and phenology. Dr. R. E. McArdle will be chief of this section, the remaining personnel being Messrs. Matthews, Isaac, Kolbe and Morris, and the temporary assistants working with them. This change carries farther the section organization already in effect at the Station in the Section of Forest Products and of the Forest Survey.

Automobile Costs - The Station's seventeen cars traveled 180,179 miles in the year 1932. Their cost of operation ran all the way from $.015 to $.027 per mile, exclusive of drivers' time for maintenance. Most of them are Model "A" Fords, the cumulative operating cost of which is just a shade over two cents per mile. The mileage per gallon of gasoline for these cars runs from 15 to 18¾, averaging 17.

Selective Logging Seminars - The Station has made, during the past month, a series of most effective contacts with the industry by means of informal, round table conferences with selected groups of timber operators, logging engineers and superintendents. The purpose of these seminars was for Brandstrom to present the results of his selective logging studies at least to the extent of acquainting the industry with the existence of his vast amount of data and the significance of the principles of selectivity on timber exploitation finance. Seven meetings have been held so far to which selected individuals were invited. The response has been notable, sometimes exceeding twice the number expected. These conferences have been held as follows:

1. Portland - consulting logging engineers and association representatives.
2. Portland - Columbia River loggers.
3. Seattle - Puget Sound loggers.
4. Tacoma - Weyerhaeuser Timber Company officials.
5. Tacoma - Tacoma lumbermen.
6. Seattle - Simpson Logging Company executives.
7. Hoquiam - Grays Harbor lumbermen.

The Director attended four of these meetings.

Staff Meetings - A weekly staff meeting has been held regularly through January, at all of which Mr. Dutton, liaison officer of the Regional Office and/or other members of the Regional Office have been present. The subjects for discussion have been fire depletion phase of the forest survey, conducted by D. N. Matthews; lookout visibility studies, by R. E. McArdle; motor truck logging, by E. F. Rapraeger.

Section of Silviculture

Arboretum - The good seed crops of last fall made possible the collection of sufficient tree seeds to supply most of the requests for seed of Pacific Northwest species. During January, 263 packets of seed were sent to cooperators in several countries. The species distributed this year include: Douglas fir, Sitka spruce, western hemlock, western red cedar, weeping spruce, knob-cone pine, noble fir, lowland white fir, Pacific yew, Pacific dogwood, cascara, red alder and western paper birch.

Douglas Fir Heredity Study - Morris completed the analysis of average height for 15 and 16-year-old progeny of various types of parent trees. Thus far no significant differences in progeny (as indicated by average height) have been found due to the age of the parent trees.

Reforestation - Isaac made the fifth annual seeding of plots on cut-over lands in the spruce-hemlock type using the indigenous small-seeded tree species, Sitka spruce, western hemlock, western red cedar and red alder. To date, exceptionally good results have been obtained on cut-over land one and two years after slash burning when seeded with from one to two pounds of seed per acre. Similar seeding on older burns has not been so successful. This method of reforestation (which, because of rodents and birds can not be used with Douglas fir and other species having large seeds) appears to offer decided possibilities for restocking logged-over lands in the fog belt. The initial cost appears cheaper than planting, and for that reason is especially suitable for those who can not afford the expense of maintaining a nursery.

Lightning Storm Study - During the period June 9 to October 26, 1932, there were 65 days when lightning storms are reported to have occurred somewhere on the national forests of Oregon and Washington. Lightning storms occurred on 24 days (of the 65) on one or more forests of the Blue Mountain group; on 34 days in the western-central Oregon group of forests; and on 41 days on one or several of the Washington forests. For each group of forests, on most of these days, the storms were very local, affecting only one forest. Storms were extensive over each group of forests on less than one fourth of the total number of storm days. The working plan for this study was revised.

Fire Damage (Depletion Phase of Forest Survey) - Computation of the results obtained from the field check of 45 fires on national forest land has been completed as has also the compilation of a summary of all Class C fires on the national forests. Matthews is now compiling fire damage data for private lands, using Shepard's supplementary fire reports and also obtaining other information from the Survey men who worked in the counties where fires were studied. This project has produced some interesting sta-

tistics as to what happens to various cover types when they burn over. For instance, an analysis of quadrats representing 2,466 groups of four 13.2-foot squares taken at 1-chain intervals on various fires throughout the Douglas fir region indicates that when Douglas fir reproduction of average stocking is burned over about 62 per cent of the area will become deforested, 27 per cent will be reduced to poor stocking, 8 per cent will become medium stocked, and only 3 per cent will be well stocked after a fire.

## Section of Forest Products

At the request of the Grays Harbor Chamber of Commerce, Lodewick spent four days in Hoquiam and Aberdeen. A portion of the time was spent in contacting the mills and secondary wood-using industries; and a portion in conference with various Chamber of Commerce officials and the Chamber's Industrial Committee advising as to ways and means of encouraging the development of Grays Harbor industries. On this same trip, Lodewick attended the annual meeting of the West Coast Lumberman's Association in Tacoma on January 27.

The requests handled by the Section of Products during the month have been many and varied. Among them have been (1) a request by a Portland wholesaler for definitions of certain trade terms; (2) a request from the State Librarian for information and references to research on the thermal expansion of wood. The request originated from the State Highway Engineer. (3) A request from the Forest Products Laboratory to investigate the dropping of needles on Douglas fir Christmas trees shipped to the mid-West. (4) An inquiry regarding the harvesting and marketing of hemlock pulpwood. (5) A request for list of cascara bark wholesalers. (6) A request for list of veneer bolt purchasers. (7) An inquiry from a truck operator for the weights of Douglas fir and ponderosa pine logs. (8) A request from a staff writer of the Oregonian to prepare a digest of the census report on timber cut from farms in Washington and Oregon.

Lumber, Lath and Shingle Census - As in previous years, the Section of Products is cooperating with the Census Bureau in gathering lumber production statistics for Oregon and Washington. A total of 2,047 schedules were sent out during the month. To date returns have been received from 560 companies.

Douglas Fir Mill Scale Studies - Rapraeger has spent his entire time computing on the Douglas fir mill scale studies which were made at two Willamette Valley mills. The overruns at these two mills on a rough-green lumber tally basis were almost identical, being 13.84 per cent in one case and 14.32 per cent in the other.

## Mensuration

Average Yields of Several Forest Types in Lewis County, Washington - During the strip survey of Lewis County, the Forest Survey measured a large number of sample plots distributed methodically over the entire western two thirds of the county. Since the type, age, site and diameter tally were noted on each plot, a good basis was obtained for the construction of

average or empirical yield tables for this county. The following tabulation contains the chief results and shows the relative producing power of the different types:

| Age | Type: Douglas fir Sites I, II, III | Hemlock | Cedar | Other conifers | Red alder |
|---|---|---|---|---|---|
| | Yield per acre in M bd. ft. Scribner rule | | | | |
| 20 | .7 | | | | .4 |
| 40 | 3.6 | .6 | 1.7 | 2.8 | 8.2 |
| 60 | 16.0 | 15.5 | 14.0 | 11.5 | 9.9 |
| 80 | 36.0 | 30.0 | 22.5 | 26.0 | 10.4 |
| 100 | 54.0 | 40.0 | 29.5 | 41.0 | 10.8 |
| 120 | 70.0 | 47.0 | 36.0 | 53.0 | 11.1 |
| 140 | 84.0 | 52.0 | 41.5 | 58.5 | 11.2 |
| 160 | 95.0 | 56.0 | 46.5 | 62.5 | |
| 180 | 102.0 | 60.0 | 51.0 | 65.5 | |
| 200 | 108.0 | 63.0 | 55.5 | 68.0 | |
| 250 | 121.0 | 69.5 | 66.0 | 71.0 | |
| 300 | 130.0 | 74.5 | 75.0 | 73.0 | |
| 350 | 137.0 | 78.0 | 83.0 | 74.5 | |
| 400 | 143.0 | 81.0 | 91.0 | 75.5 | |
| 500 | 152.0 | | | | |
| 600 | 158.0 | | | | |

The volumes for conifers are limited by a minimum DBH limit of 16 inches to a top utilization of 12 inches, but the hardwoods are scaled down to 12 inches DBH. No deductions are made for defect, but on the otherhand no cull trees were included. In terms of the fully stocked stand, the values for Douglas fir type average between 80 and 90 per cent, a creditable showing for the average yields over large areas.

## Forest Insurance

The major effort of January was the causative hazard study of the ponderosa pine region. This is now well under way with ten years' fires in Crook and Klamath Counties plotted on the maps. The planimetering of Crook County is also completed. At present plotting is in progress in Grant County.

In addition preparation has been made for the beginning of the contributive hazard study. Preliminary study is completed and the necessary forms have been mimeographed. A considerable amount of preliminary study has also been completed on the climatic phase of the pine region. It is slightly possible that no great amount of additional work will be required on this phase. The present indication is that two zones will be required, at the most, one covering the region of the Blue and Wallowa Mountains, and one covering all of the rest.

Selective Logging in Douglas Fir

During the first part of the month the revision of Part I was completed with the exception of Appendix A. The completion of Appendix A has been delayed because Brandstrom's time since January 12 has been devoted largely to the series of round table conferences, or preparation for such conferences, which have been held with groups of lumbermen, referred to earlier in this report. The meetings have generally lasted from 3 to 5 hours. To date a total of about 75 timber owners, logging operators and engineers have been contacted in this manner. The response given and the interest shown at these meetings has been very gratifying, and it is felt that this method of getting the industry's attention to these studies has been highly successful.

As a result of these conferences several requests have been received by timber owners to have Brandstrom visit their operations later this spring to advise them in regard to the opportunities such operations may offer for adaptation to selective logging or other modifications of present operating practice.

New Public Domain

Mr. Wilson spent much time rechecking the delinquency and public ownership data for some of the sample counties he has studied. Broad discrepancies have been found between county and other public records. It seems inevitable that the maps will contain certain errors due to conflicts in sources of information, but the status is changing constantly and these discrepancies will not destroy their usefulness. An opportunity was had for showing the status of delinquency map of Clatsop County to Governor Meier who appeared greatly interested and requested that he be shown maps of other counties when they were ready. The Western Pine Association and the Regional Forester have contributed draftsmen to expedite the completion of delinquency maps of Tillamook and Douglas Counties, Oregon. Correspondence with the State College of Washington indicates that intensive studies of some western Washington counties are under consideration as a follow-up of this project. Material has been furnished the Grays Harbor County agricultural agent and to various other outside agencies, indicating that the study is answering a real need long before its completion.

Forest Survey

January marked the beginning of the big job of office computation and recapitulation. The eleven members of the staff, augmented by two men detailed from the regional forests and by three temporary helpers, have been at this work in both the Lewis Building and at the overflow office in the laboratory on the east side of town. Work has been concentrated on the 13 counties comprising the North Puget Sound, Columbia River (Washington) and Willamette River economic units. Adjustment cruisers have been busy rechecking and overhauling adjustment cruise data to make certain there are no errors in the adjustment factors set up for bringing all private and other cruise data to one common standard. Some time has been spent by two men at the offices of the local Indian agencies and at the Washington State

Land Office getting the current status of ownership of Indian and State lands. A third man has spent quite a little time at the General Land Office at Roseburg getting the current status of public domain and vacant O and C lands.

One of the difficult administrative problems of the Survey is to determine where to stop in the effort to get the current status of ownership in a reasonably correct manner. Any county may have national forest, private, state, county, municipal, public domain, O and C, Indian, and other federal lands within its borders. In order to get the current status of any and all these ownerships, the Survey has had to go to as many different places as there are ownerships involved; and even when it has carefully gathered all the data from the many different sources and compiled them on township plats, there have been many conflicts and discrepancies. Shall the Survey staff simply ignore minor discrepancies in ownership records or shall it try to straighten them out? The latter is a slow and usually rather expensive job, the value of which is exceedingly doubtful considering the possibility that the ownership may change in the next six months anyway. There is no particular rule or formula for deciding when to stop in this connection and each particular case has to be decided as it comes up.

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## SOUTHERN FOREST EXPERIMENT STATION

### Management

Preliminary work was begun by Bull and Bickford on the establishment of plots for experimental cuttings in mixtures of hardwoods and pine designed to improve the stand and make possible a profitable cutting at some later date. The current cutting is expected to pay for itself.

### Forestation

Gemmer spent the major part of the month on the Choctawhatchee supervising some cuttings and planting native and exotic species, with various treatments, on experimental areas. A new planting tool, a dibble blade with a pistol grip handle, was used in the planting operation and found to be quite satisfactory for one-man planting. About 500 trees per day can be planted with this improvised dibble or planting bar.

### Protection - Fire

Wyman and Liefeld mapped and cruised section 18 of the Olustee tract prior to the establishment of plots for fire studies. An experiment in scorching and defoliation was initiated.

Bessin completed the data on fire plots established April, 1932, after a fire in the North Pasture plantations at Bogalusa. He found 47 per cent survival in the loblolly pine plantation (1924-25 planting), 93 per cent in slash (planted 1925-26), and 99 per cent in slash (planted 1924-25). He

also reports the following growth data after fire in the Bogalusa plantations:

Average increase in height during 1932 growing season

| Loblolly pine planted 1924-25 | | Slash pine planted 1924-25 | | Slash pine planted 1925-26 | |
|---|---|---|---|---|---|
| Burned | Unburned | Burned | Unburned | Burned | Unburned |
| Feet | | | | | |
| 1.2 | 3.4 | 2.2 | 3.5 | 1.5 | 3.1 |

Experimental controlled light-burnings were observed at Urania and at Crossett, Arkansas, but due to the moisture conditions at the time of the fire the results were not considered satisfactory.

Red Gum Growth and Yield

The red gum growth and yield field crew spent three weeks scouting in Alabama for suitable stands in which to establish plots following the decision to extend the study to include the bottomlands of all the main drainages of the South Atlantic and Gulf States. High water in the Tombigbee and Black Warrior bottoms hindered the scouting to some extent. Several excellent stands of old field red gum, 40 - 80 years old, were found in the Alabama River bottoms in Monroe County, in the southwestern part of the State. These stands are in the first bottoms and overflow as often as two or three times a year. In the high waters during early January, they were in water 10 - 20 feet deep.

Financial aspects of Private Forestry

Rapid progress was made during the month on the final reports for county and case studies. There have been several requests for the information contained in them and they will be completed as rapidly as possible.

The manager and assistant manager of a large lumber company operating in shortleaf-loblolly pine timber made a special trip to New Orleans to ask for cooperative studies along financial aspects lines and an entire day was spent in conferences with them. If the proposed cooperative studies are undertaken, they should prove of mutual benefit to the Station and the company. The visit of these officials of a large lumber company is considered significant since it evidences a growing interest in practical forestry on the part of progressive lumber companies in the South.

Ineson completed his temporary assignment on the 15th, but is spending a month or more of his own time in Pearl River County, working up data for his doctorate at the University of Michigan. As a part of his official assignment, Ineson is submitting to the Station a new method for predicting growth of stands. His proposed method will be mimeographed and distributed to the experiment stations and others for comment. If the method is acceptable, it will remove some uncertainties that have developed in predicting growth of stands, which is an important link in Financial Aspects studies.

Reynolds reports that the top utilization, for lumber production, of shortleaf and loblolly pine at a large, representative Arkansas mill was as follows:

Average diameter in inches inside bark of top cutting limit for sawlogs

| D.B.H. | Shortleaf | | | Loblolly | | |
|---|---|---|---|---|---|---|
| | 2-log | 3-log | 4-log | 2-log | 3-log | 4-log |
| 10 | 7.2 | 6.3 | 5.4 | 6.6 | 6.0 | 5.0 |
| 12 | 8.9 | 7.8 | 6.7 | 8.3 | 7.4 | 6.3 |
| 14 | 10.6 | 9.3 | 8.0 | 9.9 | 8.8 | 7.6 |
| 16 | 12.2 | 10.7 | 9.3 | 11.5 | 10.2 | 8.8 |
| 18 | 13.8 | 12.2 | 10.5 | 13.1 | 11.5 | 10.1 |
| 20 | 15.4 | 13.6 | 11.7 | 14.7 | 12.8 | 11.3 |
| 22 | 17.0 | 15.0 | 12.9 | 16.3 | 14.1 | 12.4 |
| 24 | 18.5 | 16.3 | 14.1 | 17.8 | 15.4 | 13.6 |

## Forest Survey

Hardwoods. The office force has continued with the computation work for both the Upland and Delta units of Mississippi. New aspects and problems keep coming up in this work and as no precedent has been set in office procedure, it has meant pioneering along several lines to determine the best method of approach. The growth and depletion phases of the work have presented special difficulties and the occurrence of so many species of commercial importance has complicated matters considerably. Methods which can be applied in regions where one or two species are predominant do not apply when 20 to 30 species in various mixtures are found on a variety of sites with varying cutting history.

In working up the ownership data obtained from the tax rolls in the Delta counties, it was found that 37 operating companies own about 331,500 acres of timberland in holdings of one thousand or more acres. Plantation holdings, in units of 1,000 acres or more, account for about 451,000, and about 47,000 acres are owned by banks and insurance companies.

More than 80 per cent of the virgin timber is owned by operating companies. The largest acreage owned by one company amounts to around 60,000 acres. This same company also owns the largest amount of virgin timber.

Pine. Two field crews resumed work in the shortleaf pine-hardwood region of northern Mississippi. Field work has been greatly hampered by the condition of secondary roads and by washouts of small bridges. The crews have had to spend more than the usual amount of time in pushing and digging cars out of mud holes and soft places.

Owing to past cutting operations, the timber stands in this region have been greatly depleted. Only a few scattered stands of first-class shortleaf have been found along the survey lines and several of these are now being cut. One large operation is going back over areas previously cut and is taking

out the remaining merchantable trees. Many of the second growth old field stands are only partially stocked and the trees in the stands resemble open grown shade trees. These trees are so limby, crooked and short-boled that they can not be classed as sawtimber. The first appearance of any loblolly pine stands was recorded on line 7 in Chickasaw County.

Volume table measurements on 17 shortleaf pines were taken and indicated that the pine volume tables would have to be carefully checked.

Foster reported that fires were very prevalent in the pine stands in the western portion of Carroll County and even the stone stump, part of the Confederate Soldier's monument at Carrollton, portrayed a fire scar.

Forest Products Pathology

Examination of the large scale lumber dipping tests on hardwood at Clarks, La., this month practically completed the season's commercial scale tests. Results at this mill largely confirm previous findings and show that the chlorinated phenol compounds used at concentrations from .6 per cent to 1 per cent are very effective in controlling stain and mold, and also possess a high degree of resistance to the washing effects of rain.

The test data are being summarized now, and will be in shape for publication during February.

Plans are now being made for the establishment of a third pole pretreatment test on a commercial scale at one of the plants of the International Creosoting & Construction Company. Both dipping and spraying treatments, alone and in combination, will be employed in an effort to determine the most effective and practical pre-treatment.

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## RESEARCH IN REGION 2

During the early part of the month the project memorandums for the Regional Investigative Committee were prepared, as was also the original draft of the annual investigative report. Roeser spent the week of January 22 in the Regional office arranging the program for the coming investigative meeting and reviewing the report and memorandums with Mr. Cochran, prior to having them typed. Messrs. Cochran, Douglas, and Higgins were engaged, during part of the month at least, in preparing the write-ups of those sections of the report for which they are responsible.

Ranger Roy L. Williams reported from Custer, South Dakota, on January 7. He was immediately assigned to work with Junior Forester Lepley in tabulating and compiling stand and growth data based on the latest remeasurements for various management sample plot units. By the end of the month the records had been worked up for the following projects and units:

Thinning in Black Hills ponderosa pine; Plot 1 and 2, Gene Crasse Gulch, in 135 -150 year old stagnated pole stands;

Thinning in sapling stands of Douglas fir within the Front Range of the Colorado Rockies;

Plots 1 to 4, inclusive, Jarre Canyon, Pike Forest;

Plots C-33 and 35, Fremont Experimental Forest;

Management of the Experimental Station Forest; Plots C-16 and C-20.

Mt 101

In 1912 two 1/2-acre plots were established in a rather heavily stocked, even-aged, pole stand, 135 - 150 years old, near the Merritt Ranger Station on the Black Hills Forest. Cutting under usual timber sale conditions had been completed upon the area but a short time before, and the stands were taken as found, no record being made of the number of trees cut or amount of material removed. Because of the prevalence of small poles, the stand on Plot 1 was left largely untouched. Approximately one third of the total cubic volume, in a comparatively small number of 12 to 16-inch trees, had been removed from the area in which Plot 2 was established. The results of the subsequent remeasurements, which cover a 20-year period, are as follows (on a one-acre basis):

| | Plot 1 (Largely untouched) | Plot 2 (Approx. 1/3 of volume removed) |
|---|---|---|
| Number of trees: | | |
| 1912 | 346 | 220 |
| 1932 | 290 | 194 |
| Mortality per cent | 16.2 | 11.8 |
| Reproduction over 4-1/2' tall in 1932 | 1762 | 952 |
| Average net diameter, breast high (inches): (1) | | |
| 1912 | 8.690 | 8.971 |
| 1919 | 8.914 | 9.188 |
| 1924 | 9.245 | 9.436 |
| 1928 | 9.419 | 9.682 |
| 1932 | 9.624 | 9.865 |
| Total periodic accretion, | .934 | .894 |
| Average annual rate of accretion, | .047 | .045 |
| Cubic volume (cubic feet): (1) | | |
| Original, 1912 | 3798 | 2587 |
| Final, 1932 | 4073 | 3029 |
| Mortality, total | 336 | 270 |
| Mortality, per cent (based on original volume) | 8.8 | 10.4 |
| Average net increment, per acre, annum, | 13.75 | 22.10 |

| | | |
|---|---|---|
| Average net increment, per acre, per cent | 0.36 | 0.85 |
| Merchantable volume (feet b.m.): (1) | | |
| Original, 1912 | 14248 | 10102 |
| Final, 1932 | 16606 | 11884 |
| Mortality, total | 820 | 1004 |
| Average net increment per acre, annum, | 117.9 | 89.1 |

(1) Exclusive of reproduction.

The diameter of the average residual tree has increased less than one inch on either plot since 1912. The thinned stand has had a higher average net cubic increment, but its increment rate, in terms of merchantable volume, has been less than that of the control stand. Increment based on cubic volume has been at the rate of 0.36 per cent on the control plot and 0.85 per cent on the thinned plot, which represents a very low return on the investment. All in all, it appears that thinning in stands of this character constitutes uneconomical practice and that if thinnings are to be of any material benefit in producing better timber, they must be made earlier in the life of the stand. The presence of an abundant, albeit patchy, stand of reproduction emphasizes the desirability of making a heavy cut in the old stand and concentrating the objective of management upon the second growth stand.

Mt 161

In 1928, the results of 9-1/2 years' study on two Fremont plots and 6 years' study on four Jarre Canyon plots in the Douglas fir thinning experiment, were published in the Journal of Forestry under the title, "Effect of Thinnings in Sapling Douglas Fir in the Central Rocky Mountain Region". During the past year, these plots were again remeasured. In the following table the more pertinent data relating to average diameter and volume (tentative) may be compared with those obtained in previous measurements. All data are on a one-acre basis.

| | Fremont | | Jarre Canyon | | | |
|---|---|---|---|---|---|---|
| | Unthinned | Thinned | Unthinned | Lightly thinned | Moderately thinned | Heavily thinned |
| Spacing distance | .. | 7'x7' | .. | 5'x5' | 6.5'x 6.5' | 8'x8' |
| Number of trees: | | | | | | |
| Stand left | 1583 | 737 | 2402 | 1490 | 927 | 593 |
| Stand in 1932 | 1765 | 930 | 1918 | 1416 | 951 | 608 |
| Average diameter (inches: | | | | | | |
| Stand left | 2.71 | 3.47 | 2.60 | 2.29 | 2.24 | 2.63 |
| Stand in 1927 | 2.93 | 3.74 | 2.97 | 2.79 | 2.90 | 3.37 |
| Average annual gain prior to 1927 | 0.02 | 0.03 | 0.06 | 0.08 | 0.11 | 0.12 |

| | Fremont | | Jarre Canyon | | | |
|---|---|---|---|---|---|---|
| | Un-thinned | Thinned | Un-thinned | Lightly thinned | Moderately thinned | Heavily thinned |
| Stand in 1932 | 3.12 | 3.99 | 3.30 | 3.18 | 3.38 | 3.86 |
| Average annual gain last 5-yr.period | 0.038 | 0.050 | 0.066 | 0.078 | 0.096 | 0.098 |
| Volume (cubic feet): | | | | | | |
| Stand left | 681 | 472 | 777 | 367 | 211 | 196 |
| Stand in 1927 | 893 | 701 | 911 | 562 | 388 | 353 |
| Annual net increment, prior to 1927 | 23.0 | 24.2 | 22.4 | 32.6 | 29.5 | 26.1 |
| Stand in 1932 | 1016 | 842 | 991 | 668 | 506 | 445 |
| Annual net increment since 1927 | 24.6 | 28.2 | 16.0 | 21.2 | 23.6 | 18.4 |
| Per cent annual net increment (full period) | 3.4 | 5.4 | 2.5 | 7.5 | 12.7 | 11.6 |
| Per cent average annual mortality | 0.04 | 0.02 | 1.02 | 0.64 | 0.33 | 0.48 |

The growth period for the Fremont area is 14-1/2 years and for the Jarre Canyon area, 11 years. At the time of thinning the average age of the stand on the former area was 60 years, while that of the latter was 39 years.

On both of the Fremont plots there has been an acceleration of both diameter accretion and volume increment during the last five-year period over the early period which included the first 9-1/2 years. On the Jarre Canyon plots only the unthinned stand shows a diameter increase for the last five-year period over the early period, while the diameter growth rate on the three thinned plots during this period fell below that of the first six-year period. On all of the plots of the Jarre Canyon group there was an appreciable dropping off in the rate of volume increment.

The big difference between the two groups of plots, in so far as mortality percentage is concerned, is due to the pernicious effect of "pitch girdle", which is very prevalent in the Jarre Canyon stands. The rate of mortality in the unthinned stand, in which the disease is especially active, has averaged one per cent of the original volume annually. The data relating to the occurrence of and damage inflicted by "pitch girdle" during the last five-year period have not yet been compiled.

The results of the latest remeasurement of the Douglas fir thinning plots, considered apart from the reproduction factor, indicate that a moderate thinning to about 900 trees per acre may be expected to make the most satisfactory all-round growth, at least during the first decade following such thinning.

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## MANUSCRIPTS

### Lake States

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### Northern Rocky Mountain

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### Northeastern

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### Pacific Northwest

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Descriptive memoranda for Forest Survey Field Work and General Conditions in Skamania County, Wash. By W. H. Bolles.

Report on the 1931 Remeasurements of the Siuslaw Permanent Sample Plots in Second-growth Douglas Fir. By W. H. Meyer.

Second Report on Permanent Sample Plots 1, 2, 3, and 4, Olympic National Forest. By W. H. Meyer.

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